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MONTHLY REPORT - October, 1994

Contract No. F49620-94-C-0042,DEF
"The use of Electrochemistry and Ellipsometry for Identifying and Evaluating Corrosion on Aircraft"

Electrochemical corrosion testing using AC Impedance measurements, ellipsometry and X-ray Photoelectron Spectroscopy (XPS) is progressing according to the Plan of Action and Milestones (POAM) submitted in July, 1994. The development of the corrosion sensor is on schedule and the data from the feasibility study show that the signature from a corroding aircraft is repeatable.

Initial fabrication of the test electrodes was met with little success. The first template designed incorporated the use of an aluminum screen through which the paint was to be applied. Due to the consistency of the conductive paints, much of the paint adhered to the screen and not to the coating. This technique was abandoned for a more practical approach using adhesive tape to lay the pattern of the grid. This technique proved to be simpler in design and proved to be a better technique in applying the paint.

Silver paint was added to the scope of testing to provide another low cost alternative to the gold paint since there was concern that the carbon paint might not give accurate results due its low electrical conductivity.

It was found that the conductivity of the gold paint increases with cure temperature as supported by the specification sheet sent with the paint. However, there was concern that elevated cure temperatures might adversely alter the integrity of the coating. Therefore the lowest possible recommended cure temperature of 50° C was chosen for all the paints.

Each coupon is comprised of two wires, a painted electrode grid, and the coated sample. One wire is bonded to the metal on the backside of the coupon and acts as the working electrode. The second wire is bonded to the painted grid and acts as the reference and counter electrode. This two-electrode approach is ideally suited for in-situ real time analysis of a metal/coating system. The electrodes have thus far been tested using the AC Impedance technique with success.

A detailed report dated October, 1994 was presented to the Program Manager with the data obtained to date.

A presentation has been prepared for delivery at the Poster Session, Sunday, October 23, at the National Academy of Sciences.